mathematical; the business of the mathematician (as Kirchhoff and Pearson have so well pointed out) is to provide, if possible, a descriptive scheme, such, for instance, as the so-called "law" of gravitation and its mathematical consequences, which reduces a complex group of phenomena to an intelligible system. Anything beyond this is metaphysics, and outside the domain of physical science and mathematics as well.

G. B. M.

APPLICATIONS OF PHOTOGRAPHY IN SCIENCE AND TECHNICS.

Angewandte Photographie in Wissenschaft und Technik. Edited by K. W. Wolf-Czapek. In vier Teilen. Pp. xvi+100+37 plates; pp. 119+41 plates; pp. 95+42 plates; pp. 98+37 plates. (Berlin: Union Deutsche Verlagsgesellschaft Zweigniederlassung Berlin, 1911.) Price 20 marks.

THERE is scarcely a science to-day wherein photography is not employed in one form or another, and even our industries make use of it in a host of different ways. So universal has become the adoption of this form of obtaining permanent records of things living and inanimate that specialists have sprung up in all directions who are able to bring to bear a great amount of experience, not only in how to apply photography to the particular case in question, but the most appropriate apparatus and methods to be adopted to secure the best results.

If, for instance, one wishes to launch out in the domain of photomicrography the first step is to find out what has been written on the subject, and then secure a book which is recommended as containing the best methods to be followed. Or, again, the special field of photographing fast-moving objects, like rifle bullets, is one that requires a good deal of attention before satisfactory results can be obtained. It often happens that one wishes to tackle one branch of photographic work which is outside the domain of that to which one is accustomed, and hence there follows an inquiry into the methods, special apparatus, and material required.

Now the work under review is a veritable *vade mecum* in this respect, for it deals, and deals exceedingly well, with the application of photography in practically every important aspect, both in science and the technics. It is only natural that for such a volume to be of value it must necessarily be the work of numerous men, for no one man can have had experience in all the multitude of applications. Herr K. W. Wolf-Czapek has done well therefore in gathering round him a number of workers who are authorities on the branches about which they write, and the result is one that is eminently satisfactory. The book itself contains 407 pages and 159 plates, with 470 illustrations on them, so that the reader will at once gather the fact that both methods and examples are amply illustrated and described. The contents are divided into four parts under general subheads, namely (1) inorganic physical sciences, such as physics, chemistry, astronomy, &c.; (2) organic physical sciences, such as botany, zoology, &c.; (3) technical science, such as photography applied to war, engineering press, &c.; and lastly (4) social problems, as anthropology, criminal statistics, &c. The list of coworkers is too numerous to be given here, but when it is seen the reader can rest content that the text was in good hands. It is interesting to note that the volume was inspired by the International Photographic Exhibition held in Dresden in 1909, and that Herr Wolf-Czapek took the opportunity to utilise the exhibits as the groundwork for the volume.

In addition to a very carefully prepared table of contents, a subject-index and a name-register, the value of the work is considerably enhanced by the large number of references to the literature of the various subjects treated.

AGRICULTURE AND SOILS OF KENT, SURREY, AND SUSSEX.

Board of Agriculture and Fisheries: a Report on the Agriculture and Soils of Kent, Surrey, and Sussex. By A. D. Hall, F.R.S., and Dr. E. J. Russell. Pp. viii+206+56 figures. (London: H.M. Stationery Office, 1911.) Price 2*s.* 6*d.*

A BRIEF introductory account is given of the geological features of the area under consideration. This is followed by a concise account of the agriculture of the three counties as practised at the present day, chief reference being made to the cultivation of hops and fruit, for which this part of England is famous. Attention is also directed to the most important breeds of live stock found in the districts, the Southdown and Romney Marsh sheep receiving special notice.

The latter portion of the report is devoted to the authors' work upon the soils of the three counties. This section contains a valuable record of analyses—both mechanical and chemical—of the soils of the different localities. Messrs. Hall and Russell have taken the geological formations as a basis of work, and find that the analyses of the soils upon each formation exhibit certain common features which mark them off from those of other formations.

By a careful study of the results, it is seen that the mechanical analysis is, in a general way, indicative of the power of the soil to grow particular crops successfully, and a knowledge of the character and proportion of the component particles is frequently sufficient to enable the expert to predict with certainty the suitability of the soil to the cultivation of hops, fruit, roots, wheat, and other cereals. The chemical analyses in many instances also clearly indicate the need for particular fertilisers, and practical recommendations are made for the manuring of the various farm crops when grown on land situated on the different geological formations.

The authors modestly suggest that the report is incomplete and fragmentary. It is, however, one of the most valuable contributions made to the study of soils in this country, and it is to be hoped that some effort will be made to secure a continuance of similar work in other areas and on an extended scale. We should like to see the analysis of soils undertaken in conjunction with carefully planned experiments upon the actual fields from which the samples are drawn,

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the experiments to be continued on the same plots for a period of not less than ten years. If this were done at, say, 500 to 1000 centres, we venture to think that a vast step forward would be made; the interpretation of the figures of soil analysis would become more precise than it is at present, and the relationship between soil texture and composition and its productive power or capacity to grow crops would be more clearly understood. J. P.

OUR BOOK SHELF.

An Account of the Crustacea of Norway. By Prof. G. O. Sars. Vols. i.–v. Vol. v., Copepoda Harpacticoida. Pp. 449+284 plates. (Bergen: Published by the Bergen Museum, 1890–1911.)

BY the publication of the concluding parts of vol. v., Prof. Sars has now provided us with the first adequate account of the harpacticoid Copepoda. It was perhaps natural that pelagic Copepoda should first attract the attention of investigators, but many zoologists still appear to think that such forms constitute the principal representatives of the group. This is by no means the case, but perhaps on account of this erroneous impression, the Harpacticoida and other bottom forms have been very much neglected.

An examination of the present volume at once suggests that we still have much to learn of this interesting assemblage. The author gives descriptions of no fewer than 291 species belonging to 99 genera, but at the same time he tells us in his preface that his latest excursion in the summer of 1910 produced about forty additional species, many of them new to science, and most of them obtained in a single locality. This is sufficient evidence that a great deal yet remains to be done, and indeed it is only on the British coast, in addition to that of Scandinavia, that the true bottom forms have been seriously studied, in spite of their considerable economic importance.

It is a matter of some satisfaction that countrymen of our own are among the foremost authorities quoted by Prof. Sars, but this is primarily an indication that these particular forms have been little investigated elsewhere. The abundant large-scale drawings which illustrate each species afford in themselves a most trustworthy means of identification, and it is to be hoped that with such a convenient book of reference now available, a much more extended survey of the types living on the sea bottom will be attempted. We congratulate the veteran author on the successful completion of another volume, and the scientific public on the steady growth of this very valuable work.

W. A. CUNNINGTON.

Traite de Chimie Générale. By Prof. W. Nernst. Ouvrage traduit sur la 6e édition allemande par Prof. A. Corvisy. Deuxième Partie, "Transformations de la Matière et de l'Énergie." Pp. 422. (Paris: A. Herman et Fils, 1912.) Price 10 francs.

THE issue of the translation in two parts is to be commended, for the original has grown to such an extent in passing through its six editions that a single volume would be of inconvenient dimensions. It is only quite recently that an English version, revised in accordance with the sixth German edition, made its appearance, and was reviewed in these columns. In these circumstances, it need only be said in reference to the general character of the book that the translator's work in the second volume is of the same high standard as that attained in vol. i.

With regard to the treatment of the subject-matter, attention may be directed to the question of catalysis. In explanation of the general catalytic activity of acids it is assumed, as usual, that the active agents are the free hydrogen ions. It is true that many of the older observations relating to the catalytic activity of acids can be accounted for on this theory if certain subsidiary hypotheses are accepted, but this apparent harmony between theory and experiment vanishes as soon as we leave the domain of aqueous solutions. Recent work has indeed shown that the catalytic activity of acids in non-ionising solvents is much greater than in aqueous or other ionising media, and this important fact cannot be reconciled with the usual ionic explanation of acid catalysis. In view of the importance of the question, the lack of any reference to such observations must be regarded as a serious omission in a treatise which, in so many other respects, may be considered as efficiently revised in accordance with the progress of physico-chemical science.

In regard to the much-discussed question of the nature of crystalline liquids, the author gives an excellent short summary, but considers that none of the theories advanced can be harmonised with experimental observations.

Three short notes are added by the translator dealing respectively with (1) the direct measurement of osmotic pressure by Fouard's method; (2) the radioactive elements; and (3) the methods of measuring the number of molecules in the molecular volume.

Text-book of Mechanics. By Prof. L. A. Martin, jun. Vol. iii., "Mechanics of Materials." Pp. xiii+229. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1911.) Price 1.50 dollars net.

THE present volume forms the third of a series, the first dealing with statics and the second with kinematics and kinetics, having been reviewed in NATURE of May 16, 1907, and February 6, 1908, respectively. The author has not attempted to treat the mechanics of materials exhaustively; the matter includes simple stresses and strains; the strength and elasticity of beams; statically indeterminate beams; struts and columns; torsion; general theorems of stress and strain; compound stresses; the principle of work as used in computing deflections.

The calculus has been used freely, and the impression is given to the reader that there has been a straining after mathematical effect, instead of the mathematics employed being made subordinate to the clear expounding of the mechanical principles involved. Illustrations have been taken, not because of their practical importance, or of their service in elucidating the subject, but because "they furnish interesting applications of the calculus." We note the very scanty use made of the ellipse of stress, although by means of this method much shorter and more readily comprehended solutions may be obtained in many cases. The same straining after mathematical effect may be observed in the treatment of thin cylindrical and spherical shells under internal pressure. Methods of testing and experimental results are almost absent, an omission which helps to contribute to the air of unreality in the treatment.

Some minor blemishes occur; in finding and using a formula for the horse-power transmitted by shafting, the reader is not warned that the torque must be uniform—a state of affairs which scarcely ever occurs. The "dangerous section" of a beam is defined as that at which maximum bending moment occurs; this will be the case in some instances, but a better and more general definition would be that section which has maximum stress. The book has clear diagrams, and numerous, well-considered exercises for working out are included, a point which will recommend the volume to many students.

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